

A NEW GENUS OF FOAM-INHABITING VELIIDAE (HETEROPTERA) FROM WESTERN MADAGASCAR

JOHN T. POLHEMUS AND DAN A. POLHEMUS

University of Colorado Museum, 3115 S. York, Englewood, Colorado 80110

Abstract.—A new genus of Microveliinae, *Aphrovelia*, is described on the basis of a new species, *A. phoretica*, from several localities in western Madagascar. The unusual habits of this species, which occurs on rafts of foam along the banks of sandy rivers, are discussed. Illustrations of key characters and a discussion of the relationship of this new genus to allied genera of Microveliinae are provided.

While making collections of aquatic Heteroptera during a recent National Geographic Society expedition to Madagascar we discovered a new genus of Microveliinae, for which we propose the name *Aphrovelia*, at two widely separated localities in the dry western portion of the island. The most remarkable characteristic of these veliids is their habit of living on rafts of river foam trapped by tangles of logs and sticks. This habitat is reminiscent of that described by Spangler (1986) for *Oiovelia spumicola* Spangler in Venezuela, however the insects of the genus described here were not observed to enter the foam as reported for the latter, but instead aggregated on the surface of it. A diligent but fruitless search for *Aphrovelia* in alternative microhabitats suggests that this genus is indeed restricted to the foam habitat. As far as we are aware, the only other veliid recorded from foam is *Pseudovelina gnoma* Polhemus from Ceylon (Andersen, 1983). Since *Aphrovelia* and *Oiovelia* are not closely related genera and are widely separated geographically, we conclude that the spumicolous habit has evolved independently at least twice in the Veliidae.

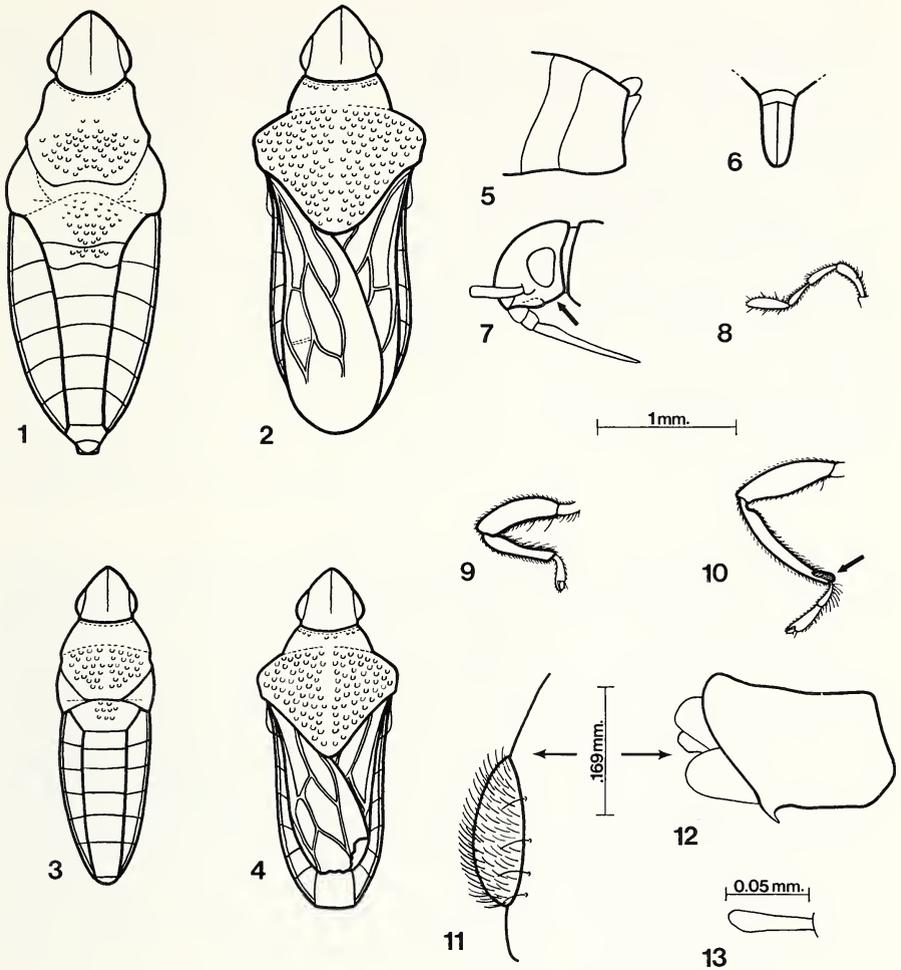
All measurements are given in millimeters. CL numbers following locality data refer to codes used by the authors to reference ecological data. Specimen repository abbreviations are as indicated in the acknowledgments.

Aphrovelia, new genus

Figs. 1-13

Description. Eyes triangular in side view; not exerted but nearly conforming to the head curvature (Figs. 1-4); not touching thorax posteriorly; anteriorly separated from the glabrous antennal tubercle (socket) by the width of antennal segment II; densely hirsute, setae curved, tips directed anteriorly (Fig. 11). Gular region long, bucculae not well developed (Fig. 7). Female pronotum strongly constricted anteriorly (Figs. 1-2). Female abdomen essentially flat dorsally, with tergites and connexiva on one plane, connexiva not raised. Male hind tibia curved and modified distally (Fig. 10) to facilitate phoresy. Tarsal formula 1:2:2. Fore wings with four closed cells, veins extending onto distal quarter (Fig. 2). Male parameres small, not well developed. Female gonapophysis 1 lanceolate. Most other characteristics as in the genus *Pseudovelina*.

Discussion. *Aphrovelia phoretica* clearly belongs in the subfamily Microveliinae



Figs. 1–13. *Aphrovelia phoretica*. 1. Apterous female, habitus. 2. Macropterous female, habitus. 3. Apterous male, habitus. 4. Macropterous male, habitus. 5. Female abdominal terminalia, lateral view. 6. Female abdominal terminalia, caudal view. 7. Head, lateral view, showing long gula (arrow). 8. Antenna. 9. Male fore leg. 10. Male posterior leg, showing distal tibial pad for grasping female in phoresy (arrow). 11. Eye, dorsal view, showing setiferation. 12. Male genital segments. 13. Male paramere.

based on wing venation, tarsal formula, leg structure and absence of ocelli. In Andersen's key (1982, pp. 418–421) to the genera of Veliidae *Aphrovelia* keys to *Microvelia*, but differs from the latter by the characteristics summarized in the table below. The fore wing venation does not extend distally as far as in *Microvelia*, but on the other hand is not truncate as in *Pseudovelia*, and is thus intermediate between these two genera. In general habitus, length of the first antennal segment, long male fore tibial comb and distally truncate female abdomen *Aphrovelia phoretica* more

Table 1. Characters for separation of *Aphrovelia*, *Microvelia*, and *Pseudovelia*.

Character	<i>Aphrovelia</i>	<i>Microvelia</i>	<i>Pseudovelia</i>
Eye shape, side view	triangular	globular	triangular-globular
Eyes exerted	no	yes	yes
Eyes hirsute	yes	no	no (but see discussion)
Hind margin of eye touching thorax	no	yes	yes
Anterior margin of eye touching antennal tubercle	no	yes	yes
Gula, length	long	moderate	short to moderate
Male with patch of dark hairs distally on hind tibia	yes	no	yes, in a few species
Female thorax abruptly narrowed anteriorly	yes	no	no
Female abdomen essentially flat dorsally	yes	no	no

closely resembles *Pseudovelia* than *Microvelia*. The wing venation and head characteristics will separate these genera as will most of the characters in the table above. We have compared *Aphrovelia* to most of the described species and 23 undescribed species of *Pseudovelia*, and the only two we have seen that share several key characteristics are *P. feuerborni* (Lundblad) from Sumatra and southeast Asia and *P. betiokyi perineti* Poisson from Madagascar, both of which have a pad of densely set setae on the male hind tibia (but not as densely packed as in *Aphrovelia*), and a simple male first genital segment without adorning spines or projections ventrally. We believe the simple male genitalia are plesiomorphic, but the nature of the head and eyes in *Aphrovelia* (given in Table 1) constitute a strong synapomorphy separating it from *Pseudovelia*. Several *Pseudovelia* species have hirsute eyes, but only those species with a body covering of long setae, and the eye setae are not curved forwardly as in *Aphrovelia phoretica*. The longitudinally arched male body, strongly curved male hind femora terminating in a distinct grasping pad, anteriorly strongly narrowed female pronotum, and essentially flat dorsal surface of the female abdomen may also be synapomorphies for *Aphrovelia*, but more species will be needed to test this.

Type-species. *Aphrovelia phoretica* J. & D. Polhemus

Etymology. The generic name is derived from *Aphros*, Gr., foam, pertaining to the peculiar habitat of these insects.

Distribution. Western Madagascar, Tulear and Majunga provinces.

***Aphrovelia phoretica*, new species**

Figs. 1-13

Description. Apterous female: Ground color black, heavily marked with orange brown; broad quadrate area anteriorly, irregular median area of posterior lobe, posterior margin of pronotum, abdominal tergites III-VI medially, connexival margins, upper mesopleura, most of prosternum, acetabulae, abdominal sternites except mid-lateral longitudinal stripe, orange brown. Legs leucine to testaceous, tarsal tips black.

Vertex of head along eyes, abdominal tergites except median areas of tergites I–V, connexiva dorsally, metapleura above acetabulae, with coarse silvery pubescence.

Structural characteristics: Head long, declivant anteriorly; eyes of moderate size, not exerted, thickly set with curved forwardly directed setae (Fig. 11); not touching thorax posteriorly; anteriorly separated from the glabrous antennal tubercle (socket) by the width of antennal segment II; interocular space very wide, about 6 times the width of an eye. Antennae moderately long, moderately stout; length of segments I–IV: 0.43: 0.36: 0.29: 0.43. Pronotum long, narrow, slightly laterally expanded posteriorly; posterior margin truncate, covering mesonotum and metanotum medially; length on midline, 0.65. Mesothorax broad (Fig. 1), abruptly tapering anteriorly to narrower prothorax, entire complex forming a broad shallow sulcus for reception of male forelegs in phoresy. Abdominal tergite I long (0.40), II–VII subequal in length (0.18–0.22); connexiva not raised but coplanar with abdominal tergites, abdominal dorsum essentially flat. Legs relatively stout, not significantly modified in female; middle tibia beneath with a row of about 9–10 evenly spaced slender erect long setae curved only at tip.

Proportions of legs as follows:

	Femur	Tibia	Tarsal 1	Tarsal 2
Anterior	0.79	0.72	0.43	—
Middle	1.04	0.97	0.22	0.40
Posterior	1.26	1.30	0.22	0.43

Pregenital abdomen truncate (Fig. 5), gonocoxae elongate (Fig. 6). Female gonapophysis I lanceolate. Length, 3.38 mm.; width, 1.22 mm.

Macropterous female: Structure and coloration mostly as in apterous form. Pronotum covering wing bases, abruptly narrowed anterad of humeri (Fig. 2); broadly orange brown medially and posteriorly, humeri orange brown. Wing venation typical of Microveliinae; hemelytra white basally, gradually becoming smoky grey brown distally, without light spots; veins prominent, dark. Length, 3.28 mm; width, 1.26 mm.

Apterous male: Much smaller and narrower than female, without constricted thorax (Fig. 3). Coloration somewhat darker on posterior part of pronotum and venter. Entire body slightly arched longitudinally. Front and hind legs stouter than in female, tibia modified; fore tibia slightly arched, tibial comb about $\frac{2}{3}$ as long as tibia; posterior tibia arched, distally with a black pad on inner side for grasping the female in phoresy (Fig. 10). Pregenital abdomen without modifications. Genital segments as shown in Figure 12. Parameres symmetrical, narrow (see Fig. 13). Length, 2.34 mm; width, 0.72 mm.

Macropterous male: Coloration and structural characteristics similar to macropterous female except pronotum not as abruptly narrowed anteriorly (Fig. 4). Length, 2.59 mm.; width, 1.04 mm.

Habitat data. The type locality was a wide unshaded river of shallow depth flowing through a bed of fine sand in the dry deciduous forest country southeast of Morondava. This location was 10 km north of a newly emplaced Amoco oil rig at a site

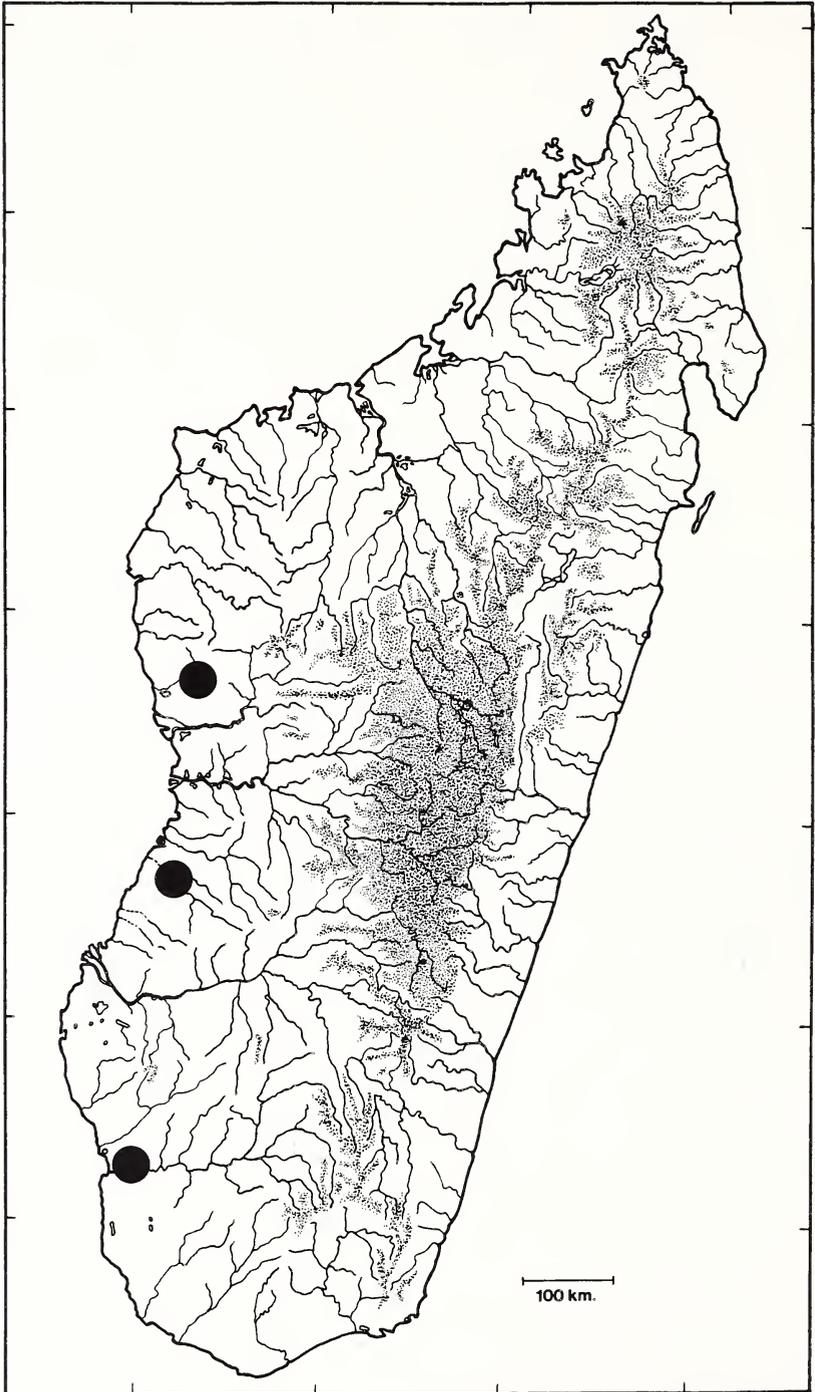


Fig. 14. Distribution of *Aphrovelia phoretica* in Madagascar. Areas above 1,000 m shaded.

company officials called "Betsimba," and although this name does not appear on any recent maps of Madagascar it is included as a reference point because of the lack of any other nearby villages or landmarks. Specimens of *A. phoretica* were found on rafts of foam that had accumulated in eddies behind fallen logs and other debris caught along the edge of the river channel. At the time of our collecting the rainy season had just commenced and the river was running knee deep and perhaps 30 meters wide. It had obviously been at a much higher flow stage several days prior to our arrival, as was witnessed by the large tangles of debris stranded far up on the banks. Western Madagascar experiences a prolonged dry season for at least half of each year (Donque, 1972), and at this time many of the sandy rivers typical of this region vanish completely. However we were assured by oil company workers and Malagasy locals that this particular stream always kept some small amount of surface flow even in the driest months.

Additional specimens of *A. phoretica* were taken along the Onilahy River, a very large stream draining the Mahalfaly and Horombe plateaus and the Isalo Massif to the south and east of Tulear. This stream was in spate at the time of our collections due to recent upstream rains and thus was considerably larger than the river near Betsimba, running over a kilometer in width and several meters in depth. Here again populations of *Aphrovelia* were found on rafts of foam caught amid debris and overhanging tree branches at the river's edge. This particular locality on the Onilahy was at Sept Lacs, where a spring fed stream originating in the cliffs of the adjoining Mahalfaly Plateau cascades through a series of seven limestone pools to enter the main river. Like the river near Betsimba, this area retains permanent flowing water throughout the dry season.

A single winged male from the Poisson collection is also at hand from "foret Antsingy," literally "forest of the tsingy," near Antsalova. The Malagasy term "tsingy" refers to highly eroded limestone pinnacles in areas of karst terrain, in this case the Bemaraha Plateau. Presumably this specimen came from a perennial spring issuing from the limestone, much like the Sept Lacs locality described above.

Etymology. The name *phoretica* refers to the propensity of the males or nymphs to ride atop the females "piggy-back" (phoresy). This behavior was observed in many pairs in the field, and is manifested in modifications of the male to facilitate phoresy. We have alcohol preserved specimens still locked together that demonstrate this coupling.

Holotype. apterous male, and allotype, apterous female: MADAGASCAR, **Tulear Prov.**, sandy river 10 km N of Betsimba oil drill site, 105 km SE of Morondava, 107 m (350 ft), water temp. 28°C., November 25, 1986, CL 2287, J. T. and D. A. Polhemus (USNM).

Paratypes. MADAGASCAR, **Tulear Prov.**: many males and females, same data as type (JTPC, TSIM); many males and females, Onilahy River at Sept Lacs, 70 km SE of Tulear, 20 m (65 ft), water temp. 28°C., November 30, 1986, CL 2296, J. T. and D. A. Polhemus (JTPC). **Majunga Prov.**: 1 winged male, Andobo, 190 m (623 ft), foret Antsingy det Antsalova, February 1957, P. Griv. (ZMUC).

ACKNOWLEDGMENTS

We wish to thank the following people, who made our successful field work in Madagascar possible in the face of difficult logistical circumstances: Vincent Razafimahatratra, Universite

de Madagascar, Tananarive; Voara Randrianasolo, Parc de Tsimbazaza, Tananarive; Jennifer Turnour, CSIRO, Tular; Bruce Hardy, Bawden Drilling, Morondava. We also wish to thank N. M. Andersen of the Universitetets Zoologiske Museum, Copenhagen, for loan of specimens from the Poisson collection, and for useful comments on the manuscript. Types are deposited in the U.S. National Museum of Natural History, Washington, D.C. (USNM); paratypes are in the collection of the Parc de Tsimbazaza, Tananarive (TSIM), the Universitetets Zoologiske Museum (ZMUC), and the J. T. Polhemus collection, Englewood, Colorado (JTTC). This research was supported in part by a grant from the National Geographic Society, Washington, D.C.

LITERATURE CITED

- Andersen, N. M. 1982. The semiaquatic bugs (Hemiptera, Gerromorpha). Phylogeny, adaptations, biogeography and classification. Scandanavian Science Press, Klampenborg, Denmark, Entomonograph Vol. 3, 455 pp.
- Andersen, N. M. 1983. The Old World Microveliinae (Hemiptera: Veliidae) I. The status of *Pseudovelgia* Hoberlandt and *Perivelgia* Poisson, with a review of Oriental species. Entomol. Scand. 14:253-268.
- Donque, G. 1972. The climatology of Madagascar. Pages 87-144 in: R. Battistini and G. Richard-Vindard (eds.), Biogeography and Ecology in Madagascar. Dr. W. Junk B. V., The Hague.
- Spangler, P. J. 1986. Two new species of water-striders of the genus *Oiovelia* from the Tepui Cerro de la Neblina, Venezuela (Hemiptera: Veliidae). Proc. Entomol. Soc. Wash. 88: 438-450.

Received July 22, 1987; accepted February 3, 1988.